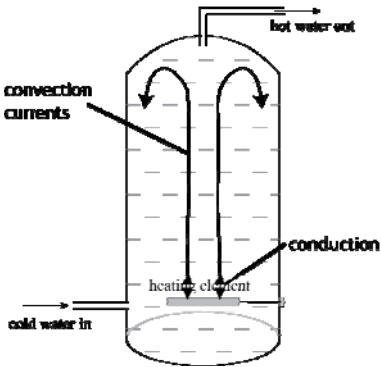


**Assessment Schedule – 2009****Science: Describe aspects of physics (90191)****Evidence Statement**

Question	Achievement	Achievement with Merit	Achievement with Excellence
ONE (a)	<p><b>Correct UNIT for acceleration / force. (a)</b></p> <p>Metres per second squared, <math>\text{m s}^{-2}</math> / Newton, N.</p> <p><b>Correctly identifies <math>F_{\text{net}}</math> for section B (a)</b></p> <p><math>F_{\text{net}} = 0 \text{ N}</math> Unit not required.</p>	<p><b>For section A: (m)</b> EITHER Correctly calculated acceleration. <math>a = \frac{\text{rise}}{\text{run}} = \frac{20}{15} = 1.33 \text{ m s}^{-2}</math> OR Incorrectly calculated acceleration substituted into <math>F_{\text{net}} = ma</math> Note: Must show what they are calculating. OR Correct solution: INCORRECT or NO unit.</p> <p><b>For section B: (m)</b> Correctly explains or calculates the net force is zero.  <math>a = 0 \text{ m s}^{-2}</math> <math>F_{\text{net}} = ma</math> <math>F_{\text{net}} = 0 \text{ N}</math></p>	<p><b>Correct solution and unit for BOTH Section A AND Section B. (e)</b> Section A: <math>a = \frac{\text{rise}}{\text{run}} = \frac{20}{15} = 1.33 \text{ m s}^{-2}</math>  <math>F_{\text{net}} = ma = 1200 \times 1.33 = 1596 \text{ N}</math>  AND Section B:  <math>a = 0 \text{ m s}^{-2}</math> <math>F_{\text{net}} = ma</math> <math>F_{\text{net}} = 0 \text{ N}</math></p>
(b)	<p><b>Correctly identifies <math>F_{\text{net}}</math> (a)</b> In Section A, the net force / thrust and drag forces is/are unbalanced</p> <p>OR In Section B, the net force is zero / thrust and drag forces are balanced.</p> <p><b>Correctly identifies resultant motion. (a)</b> In Section A the car has (constant) acceleration. OR In Section B the car has constant speed.</p>	<p><b>Correctly explains the relationship between the net force and the resultant motion for ONE section. (m)</b> EITHER For the car to change its speed / accelerate, it requires an unbalanced net force / thrust and drag forces. OR The speed is not changing, so the net force must be zero / the thrust and drag forces must be balanced.</p>	<p><b>Correctly explains the relationship between the net force and the resultant motion for BOTH sections. (e)</b>  For the car to change its speed / accelerate, it requires an <b>unbalanced</b> net force. In section A the net force is 1596 N (or follow on from a). As this net force is positive the car will accelerate. AND A net force of zero (balanced) in section B <b>means that <math>a = 0</math></b>, therefore the speed is not changing. As the car was moving already, this means that it has a constant speed in section B.</p>
Sufficiency	$4 \times a = A$	$2 \times m = M$	$1 \times e = E$

TWO (a)	<b>Correct solution or unit. (a)</b>  $W = F \times d = 25 \times 5000$ $= 125\,000$ Joule, J	<b>Correct solution and unit. (m)</b>  Correctly calculated work done $W = F \times d = 25 \times 5000$ $= 125\,000\text{ J}$	
(b)	<b>Correctly identifies type of energy at top of slope. (a)</b>  Gravitational Potential Energy OR Selects the formula $E_p = mgh$ .  <b>ONE correct statement. (a)</b>  Eg: Friction occurs between the tyres and road. OR Air resistance occurs with the car. OR Friction occurs in the moving parts of the engine / car. OR Heat is produced.	<b>A correct calculation. (m)</b>  EITHER Correctly calculated $E_p$ $E_p = mgh = 1200 \times 10 \times 10$ $= 120\,000\text{ J}$ OR Incorrectly calculated work substituted into $\Delta E = W - E_p$ Note: Must show what they are calculating. OR Correct solution: INCORRECT or NO unit.  Note: Possible follow-on error from (2a).  <b>Explains either why the energy is different or what the energy has converted into. (m)</b>  Eg: As the car moves up the slope, friction between the tyres and road and / or air resistance with the car and / or friction between the moving parts in the engine car cause the work done to not equal the $E_p$ gained. OR As the car moves up the slope, some of the energy is converted into heat (and sound) energy, therefore the work done does not equal the $E_p$ gained.	<b>Correct solution for difference in energy PLUS states what happens to the difference. (e)</b>  $E_p = mgh = 1200 \times 10 \times 10$ $= 120\,000\text{ J}$  $W = Fd = 125\,000\text{ J}$  $\Delta E = W - E_p = 125\,000 - 120\,000$ $= 5000\text{ J}$ PLUS States difference in energy changed into heat (and sound).  <b>Fully explained answer. (e)</b>  Eg: As the car moves up the slope, there is friction between the tyres and road and or air resistance with the car and / or friction between moving parts of engine / car. As a result of this, some of the energy is converted into mainly heat (and sound). As a result, the total work done by the car to reach the top of the slope does not equal the gravitational potential energy gained at the top.
Sufficiency	$2 \times a = A$	$2 \times m = M$	$1 \times e = E$

THREE (a)	<b>Describes a feature of voltage. (a)</b> Eg: Voltage is 12 V in circuit B. OR Voltage shared in circuit A with other lamp. OR Voltage in circuit A is 4 V.	<b>Explains the difference in voltage. (m)</b> Eg: EITHER In circuit B there are two pathways, each receiving full voltage from the power supply. In circuit A the voltage must be shared between the two lamps as there is only one pathway. OR In circuit B, the 4Ω lamp receives the full voltage of the power supply and a higher current than the bulb in circuit A as circuit B is in parallel. In circuit A the 4Ω lamp has a lower current and receives less voltage as voltage is shared in a series circuit.	
(b)	<b>Identifies voltage for 4Ω lamp. (a)</b> $V = 12 \text{ V}$	<b>Correct solution. (m)</b> $I = \frac{V}{R}$ $= \frac{12}{4}$ $= 3 \text{ A}$	
(c)	<b>Correctly identifies the circuit. (a)</b> Circuit B, The parallel circuit.  <b>Correct Statement. (a)</b> Eg: Higher resistance causes less current (or vice versa). OR Lamps in parallel receive a greater voltage than in series. OR Lower resistance lamp in series receives less voltage.  <b>Correct unit. (a)</b> Watt / W	<b>Correct identification and partially explains. (m)</b> Eg: 4 Ω lamp is brighter in circuit B. PLUS Has a lower resistance therefore more current flowing through it. OR Has a greater power output than the 8Ω lamp, because it has a lower resistance / increased current.  <b>ONE correct calculation. (m)</b> EITHER For Circuit A $V = 1 \times 4 = 4 \text{ V}$ OR Wrong V correctly substituted into $P = VI$ OR For Circuit B $P = VI = 12 \times 3 = 36 \text{ W}$ (Unit not required.)	<b>Identifies that the 4Ω is brighter in circuit B and explains why in terms of R, I, V, and P. (e)</b> Eg: 4 Ω lamp is brighter in circuit B. Because the 4 Ω lamp has less resistance, a greater current will flow through it. As it receives the full 12V, this results in a greater power <u>output</u> than when it is placed in series (circuit A).  <b>Identifies circuit B and gives the correct solution and unit for P for BOTH circuits and gives one correct statement. (e)</b> 4 Ω lamp is brighter in circuit B. PLUS Circuit A $I = 1 \text{ A}$ , $V = 1 \times 4 = 4 \text{ V}$ $P = VI = 1 \times 4 = 4 \text{ W}$ AND Circuit B $V = 12 \text{ V}$ , $I = \frac{12}{4} = 3 \text{ A}$ $P = VI = 12 \times 3 = 36 \text{ W}$ PLUS ONE correct statement (see Achievement), NOT only unit.
Sufficiency	$3 \times a = A$	$3 \times m = M$	$1 \times e = E$

<p>FOUR</p>	<p><b>Describes TWO correct features.</b></p> <p>Eg: Heat is conducted from the element into the water in contact with it. OR Conduction is the process whereby heat is transferred by the vibration of particles. OR Metal is a good conductor of heat. OR The rest of the water is heated by convection currents. OR Hot water is less dense than cold water. OR Hot water rises, cold water sinks. OR Convection currents will not occur if heated water enters at top. OR If hot water enters at top, hot water will stay at top cold water at bottom (or if water taken from the bottom then it will be less hot warm cold). OR Convection currents will occur if heated water enters at bottom. OR Correct arrows on the diagram for conduction OR convection. OR Hot water exits at top (since hot water rises) because that is where the hottest water will be.</p> 	<p><b>Explains TWO statements.</b></p> <p>Eg: The element is made of metal which is a (good) conductor causing heat to be transferred to the water in direct contact by vibration. OR Metal has particles very closely packed meaning that heat can be easily transferred through it by vibration making it a good heat conductor. OR Metal has a high electrical resistance, therefore when electricity passes through it, it heats up. OR Hot water is less dense than cold water, so it will rise causing the cold water to sink and fill its place, creating <b>convection currents</b>. OR If the water was drawn off from the bottom of the cylinder it would be cold as the hot water rises as it is less dense. OR As the hot water rises because it is less dense it is important for it to leave from this position (otherwise cold water would be being drawn off).</p>	<p><b>Discusses how the water heats in terms of particles AND why the element is made of metal AND why the hot water leaves from the top PLUS includes correct arrows on diagram.</b></p> <p>Eg: The element is made of metal which is a good conductor of heat because its particles are closely packed it has a high electrical resistance. This allows heat to be transferred to the water in direct contact by vibration. This heated water is less dense than the cold water as its particles are further apart, causing the hot water to rise and the cold water to sink and fill its place, creating convection currents. As the hot water has risen it is important to draw off the water from the top of the cylinder. PLUS Fully labelled arrows on diagram for BOTH conduction AND convection.</p>
<p>Sufficiency</p>	<p>1</p>	<p>1</p>	<p>1</p>

**Judgement Statement**

<b>Achievement</b>	<b>Achievement with Merit</b>	<b>Achievement with Excellence</b>
2 <b>A</b> or above	3 <b>M</b> or above	1 <b>M</b> 2 <b>E</b>

Lower case **a**, **m**, **e** may be used throughout the paper to indicate contributing evidence for overall grades for questions.

Only the circled upper case **A**, **M** and **E** grades shown at the end of each full question are used to make the final judgement.